

SYLLABUS DEVELOPMENT GUIDE

AP[®] Environmental Science

The guide contains the following information:

Curricular Requirements

The curricular requirements are the core elements of the course. A syllabus must provide explicit evidence of each requirement based on the required evidence statement(s).

The Unit Guides and the “Instructional Approaches” section of the *AP[®] Environmental Science Course and Exam Description (CED)* may be useful in providing evidence for satisfying these curricular requirements.

Required Evidence

These statements describe the type of evidence and level of detail required in the syllabus to demonstrate how the curricular requirement is met in the course.

Note: Curricular requirements may have more than one required evidence statement. Each statement must be addressed to fulfill the requirement.

Clarifying Terms

These statements define terms in the syllabus development guide that may have multiple meanings.

Samples of Evidence

For each curricular requirement, three separate samples of evidence are provided. These samples provide either verbatim evidence or clear descriptions of what acceptable evidence could look like in a syllabus.

Curricular Requirements

CR1	The students and teacher have access to college-level resources including a recently published (within the last 10 years) college-level textbook and reference materials in print or electronic format.	<i>See page:</i> 3
CR2	The course includes the required environmental legislation and policies.	<i>See page:</i> 4
CR3	The course is structured to incorporate the big ideas and required content outlined in each of the units described in the AP Course and Exam Description.	<i>See page:</i> 5
CR4	The course provides opportunities for students to develop the skills related to Science Practice 1: Concept Application.	<i>See page:</i> 7
CR5	The course provides opportunities for students to develop the skills related to Science Practice 2: Visual Representations.	<i>See page:</i> 8
CR6	The course provides opportunities for students to develop the skills related to Science Practice 3: Text Analysis.	<i>See page:</i> 9
CR7	The course provides opportunities for students to develop the skills related to Science Practice 4: Scientific Experiments.	<i>See page:</i> 10
CR8	The course provides opportunities for students to develop the skills related to Science Practice 5: Data Analysis.	<i>See page:</i> 11
CR9	The course provides opportunities for students to develop the skills related to Science Practice 6: Mathematical Routines.	<i>See page:</i> 12
CR10	The course provides opportunities for students to develop the skills related to Science Practice 7: Environmental Solutions.	<i>See page:</i> 13
CR11	Students spend a minimum of 25% of instructional time engaged in a wide range of hands-on, inquiry-based laboratory investigations and/or field work to support learning required content and developing science practices throughout the course.	<i>See page:</i> 14
CR12	The course provides opportunities for students to record evidence of their scientific investigations. Evidence can be recorded in lab reports, mini-posters, or another appropriate formal manner for inclusion in lab reports/notebooks (print or digital format).	<i>See page:</i> 15

Curricular Requirement 1

The students and teacher have access to college-level resources including a recently published (within the last 10 years) college-level textbook and reference materials in print or electronic format.

Required Evidence

- The syllabus must cite the title, author, and publication date of a college-level textbook. The primary course textbook must be published within the last 10 years.

Samples of Evidence

1. The syllabus cites the title, author, and publication date (within the last 10 years) of a college-level environmental science textbook in print or electronic format.

For example: Miller, G. Tyler and Scott Spoolman. 2018. *Living in the Environment*. Boston, MA: Cengage Learning.

2. The syllabus cites a textbook from the AP Example Textbook List for environmental science.

3. The syllabus includes a resource section where a list of resources for AP Environmental Science instruction is provided. The resource section includes the title and author of a recently published college-level environmental science textbook for science majors.

For example: *Environmental Science* (2014) by Daniel Chiras.

Curricular Requirement 2

The course includes the required environmental legislation and policies.

Required Evidence

- The syllabus must explicitly list each of the policies and legislation from the AP Course and Exam Description.

Samples of Evidence

1. The syllabus provides a list of the following 10 required policies and legislation included in the AP Course and Exam Description: Clean Air Act; Clean Water Act; Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Resource Conservation and Recovery Act (RCRA); Montreal Protocol; Kyoto Protocol; Endangered Species Act; Safe Drinking Water Act (SDWA), and the Delany Clause.
2. The syllabus specifically mentions labs, field experiences, and/or activities that incorporate the required environmental legislation and makes explicit reference to the specific policy/legislation in each associated activity.
3. The syllabus lists the required legislation and policies in the relevant units of study.

Curricular Requirement 3

The course is structured to incorporate the big ideas and required content outlined in each of the units described in the AP Course and Exam Description.

Required Evidence

- The syllabus must include an outline of course content by unit title or topic using any organizational approach to demonstrate the inclusion of required course content and associated big ideas. All nine units and all four big ideas must be included.

Note: If the syllabus demonstrates a different approach than the units outlined in the AP Course and Exam Description (CED), the teacher must indicate where the content and big ideas of each unit in the Course and Exam Description will be taught.

Samples of Evidence

1. The syllabus outline of course content cites specific chapter titles corresponding to the unit outline in the AP Course and Exam Description.

Chapter #	Chapter Title	AP Unit #	Big Idea
1	Understanding Our Environment	3	ERT, EIN
3	Matter, Energy, and Life	6	ENG
4	Evolution, Biological Communities, and Species Interactions	1, 2	ENG, ERT
5	Biome: Global Patterns of Life	1, 2	ENG, ERT
6	Population Biology	3	ERT, EIN
7	Human Populations	3	ERT, EIN
9	Food and Hunger	3	ERT, EIN
10	Farming: Conventional and Sustainable Practices	5	EIN, STB
11	Biodiversity: Preserving Species	1, 2	ENG, ERT
12	Biodiversity: Preserving Species	1, 2	ENG, ERT
14	Geology and Earth Resources	4	ENG, ERT
15	Climate Change	9	EIN, STB
16	Air Pollution	7	STB
17	Water Use and Management	5	EIN, STB
18	Water Pollution	8	EIN, STB
19	Conventional Energy	6	ENG
20	Sustainable Energy	6	ENG
21	Solid, Toxic, and Hazardous Waste	8	ENG
22	Urbanization and Sustainable Cities	5	EIN, STB

Chapter #	Chapter Title	AP Unit #	Big Idea
23	Ecological Economics	2, 8	ERT, EIN, STB
24	Environmental Policy, Law, and Planning		

2. The syllabus includes the required content organized into the following units based on the AP Course and Exam Description:

- Unit 1: The Living World: Ecosystems (Big Ideas: ENG, ERT)
- Unit 2: The Living World: Biodiversity (Big Ideas: ERT)
- Unit 3: Populations (Big Ideas: ERT, EIN)
- Unit 4: Earth Systems and Resources (Big Ideas: ENG, ERT)
- Unit 5: Land and Water Use (Big Ideas: EIN, STB)
- Unit 6: Energy Resources and Consumption (Big Ideas: ENG)
- Unit 7: Atmospheric Pollution (Big Ideas: STB)
- Unit 8: Aquatic and Terrestrial Pollution (Big Ideas: EIN, STB)
- Unit 9: Global Change (Big Ideas: EIN, STB)

3. The syllabus presents the course content in a different sequence than the unit outline in the AP Course and Exam Description and clearly indicates how each unit correlates to the AP units in the course description.

Earth's Systems (AP Unit 4; Big Ideas: ENG, ERT)

Studying the State of Our Earth	Ch. 1
Solar Energy, Greenhouse Effect	Ch. 4
Environmental Systems	Ch. 2
Earth's Systems	Ch. 8
Water Resources	Ch. 9

Living World (AP Units 1, 2, 3; Big Ideas: ENG, ERT, EIN)

Ecosystem Ecology	Ch. 3
Evolution of Biodiversity	Ch. 5
Conservation of Biodiversity	Ch. 18
Population Ecology	Ch. 6
Human Population	Ch. 7

Energy Transfer (AP Unit 6; Big Idea: ENG)

Nonrenewable Energy	Ch. 12
Achieving Energy Sustainability	Ch. 13

Human Actions and Sustainability (AP Units 5, 7, 8, 9; Big Ideas: EIN, STB)

Solid Waste	Ch. 16
Land Use	Ch. 10
Feeding the World	Ch. 11
Human Health, Environmental Risks	Ch. 17
Air Pollution	Ch. 15
Global Change	Ch. 19
Water Pollution	Ch. 14
Sustainability, Economics, and Equity	Ch. 20

Curricular Requirement 4

The course provides opportunities for students to develop the skills related to Science Practice 1: Concept Application, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- The syllabus must include a brief description of an instructional activity in which students explain environmental concepts, processes, and models presented in written format.
- Activities must be labeled with the relevant science practice(s).

Samples of Evidence

1. At the beginning or the end of class, students are shown an image of food chains or food webs. On one side of an index card, they summarize energy flow through ecosystems. On the other side, they write a question they have about the topic. The cards are collected and reviewed noting any trends in student responses. Questions and misconceptions are addressed that day (if done at the beginning of class) or the following day. **(Science Practice 1: Concept Application)**
2. The syllabus describes a strategy using exit tickets that students complete to demonstrate their understanding of concepts studied in a lesson (e.g., El Nino, island biogeography, Endangered Species Act, etc.). **(Science Practice 1)**
3. **Science Practice 1:** The syllabus describes a study of the water quality of the pond near the school in which students explore and explain seasonal stratification of lakes and eutrophication.

Curricular Requirement 5

The course provides opportunities for students to develop the skills related to Science Practice 2: Visual Representations, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- The syllabus must include a brief description of an instructional activity in which students analyze visual representations of environmental concepts and processes.
- Activities must be labeled with the relevant science practice(s).

Samples of Evidence

1. In groups, students draw food chains or webs for specific biomes on a poster. Groups then exchange posters and describe energy flow through the different ecosystems. **(Science Practice 2: Visual Representations)**
2. The syllabus describes a lab in which students gather earthquake and volcano location data from the USGS, then they draw plate boundaries and map the geohazards to analyze tectonics. **(Science Practice 2)**
3. **Science Practice 2:** The syllabus describes a lab activity in which students use pictures of cemetery headstones to analyze chemical weathering effects on different types of rocks. Visual classification data are then graphed to categorize these processes and facilitate a discussion of rock type and climate on erosion and weathering processes.

Curricular Requirement 6

The course provides opportunities for students to develop the skills related to Science Practice 3: Text Analysis, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- The syllabus must include a brief description of an instructional activity in which students analyze sources of information about environmental issues.
- Activities must be labeled with the relevant science practice(s).

Samples of Evidence

1. Students read Jared Diamond's "The Worst Mistake in the History of the Human Race." They identify the author's claim and describe the author's perspective, assumptions, and evidence that support the claim as well as the factors that may influence the scientific accuracy of the article such as author bias. **(Science Practice 3: Text Analysis)**
2. The syllabus describes an activity in which students read an environmental article from Sciencenewsforstudents.com, then describe the content, including claims and evidence presented. Students also identify author bias or other factors that may impact scientific accuracy and evaluate the limitations of the conclusions presented in the source. **(Science Practice 3)**
3. **Science Practice 3:** Students read two articles on opposite sides of the climate change issue. They then identify and describe the claims/conclusions of the authors, as well as their biases that may impact the scientific accuracy of the source.

Curricular Requirement 7

The course provides opportunities for students to develop the skills related to Science Practice 4: Scientific Experiments, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- The syllabus must include a brief description of an instructional activity in which students analyze research studies that test environmental principles.
- Activities must be labeled with the relevant science practice(s).

Samples of Evidence

1. Students read an article from a relevant journal and then determine the hypothesis, variables, controls, and experimental design based on the article. **(Science Practice 4)**
2. Students develop a hypothesis and design a lab to observe seed germination in several concentrations of salt solutions. They determine the percentage of seeds germinating as well as the radicle length of germinated radish seeds after five days. **(Science Practice 4: Scientific Experiments)**
3. **Science Practice 4:** As part of the biochemical oxygen demand lab, students collect and analyze samples and record observations.

Curricular Requirement 8

The course provides opportunities for students to develop the skills related to Science Practice 5: Data Analysis, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- The syllabus must include a brief description of an instructional activity in which students analyze and interpret quantitative data represented in tables, charts, and graphs.
- Activities must be labeled with the relevant science practice(s).

Samples of Evidence

1. Students survey an ecotone using quadrats spaced along a transect collecting species composition and several abiotic factors (light, surface temperature, humidity) as the environment changes. Students graph data sets and analyze how abiotic factors influence species composition. **(Science Practice 5: Data Analysis)**
2. The syllabus describes a lab in which students gather regional climate data (precipitation, min/max temperature) from the NOAA website, then divide into groups to determine the environmental impacts of the predicted changes in these data over time. **(Science Practice 5)**
3. **Science Practice 5:** Students conduct a cemetery lab including the collection of birth, death, and age data sets. The students use these data sets to plot graphs, and to interpret and draw conclusions from the graphs.

Curricular Requirement 9

The course provides opportunities for students to develop the skills related to Science Practice 6: Mathematical Routines, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- The syllabus must include a brief description of an instructional activity in which students apply quantitative methods to address environmental concepts.
- Activities must be labeled with the relevant science practice(s).

Samples of Evidence

1. The students calculate total annual precipitation and temperature ranges for several biomes using sets of climate data that include monthly temperatures and precipitation data from identified biomes around the world. Students use their calculations to predict biome identification and possible locations for unidentified sets of climate data. (**Science Practice 6: Mathematical Routines**)
2. **Science Practice 6:** The syllabus describes a lab in which students gather demographic data from the Census Bureau website and then graph the data and calculate percentage change in statistics such as birth rate, death rate, etc.
3. Students keep track of their energy use for a week, after which they use the data to calculate their annual energy use. (**Science Practice 6**)

Curricular Requirement 10

The course provides opportunities for students to develop the skills related to Science Practice 7: Environmental Solutions, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- The syllabus must include a brief description of an instructional activity in which students propose and justify solutions to environmental problems.
- Activities must be labeled with the relevant science practice(s).

Samples of Evidence

1. After a lesson on urbanization, students conduct their own research and then discuss in small groups the impact of urbanization on environmental processes such as the hydrological cycle. Students then identify potential approaches or solutions to reduce impacts. **(Science Practice 7: Environmental Solutions)**
2. The syllabus describes an activity in which students explore factors that affect soil erosion and agriculture practices intended to limit erosion. They then identify best management practices that can mitigate and reverse soil loss. Students write a summary, including the advantages and disadvantages of various management practices. **(Science Practice 7)**
3. **Science Practice 7:** After conducting a classroom waste audit to determine classroom trash and recycling amounts, students develop a plan to reduce the amount of solid waste from the classroom and justify the plan by explaining its potential advantages.

Curricular Requirement 11

Students spend a minimum of 25% of instructional time engaged in a wide range of hands-on, inquiry-based laboratory investigations and/or field work to support learning required content and developing science practices throughout the course.

Required Evidence

- The syllabus must include an explicit statement that at least 25% of instructional time is spent engaged in hands-on, inquiry-based laboratory experiences and/or fieldwork.
AND
- Lab investigation/field work titles must be listed along with a brief description.

Samples of Evidence

1. In the laboratory section, the syllabus states, “Students spend a minimum of 25% of instructional time engaged in hands-on laboratory and/or field work” and includes the lab titles and a brief description for each investigation and/or field study. For instance, each lab includes the following information:

Lab Title	Description
Soil Permeability Lab	Students design their own procedure to determine the permeability of sand, silt, and clay.
LD ₅₀ /Toxicology	Investigation of the lethal dose of various metal salts based on exposure to lettuce seeds during germination.

2. The syllabus includes a laboratory and/or fieldwork section. A list and brief description of laboratory and/or fieldwork is included. The syllabus also states that the amount of hands-on laboratory and/or fieldwork is equivalent to 25% of instructional time.
3. Each unit in the course outline includes a laboratory and/or fieldwork section. This section includes a list of laboratory and/or fieldwork completed for each unit and a brief description of the laboratory and/or fieldwork activities. Also included is a statement specifying that the total number of hands-on laboratory and/or fieldwork activities is equivalent to 25% of instructional time.

Curricular Requirement 12

The course provides opportunities for students to record evidence of their scientific investigations. Evidence can be recorded in lab reports, mini-posters, or another appropriate formal manner for inclusion in lab reports/notebooks (print or digital format).

Required Evidence

- The syllabus must include the components of the written reports required of students for all laboratory/field investigations.
AND
- The syllabus must include an explicit statement that students are required to maintain a lab/field notebook or portfolio (hard copy or electronic) that includes all lab/field reports.

Clarifying Terms

Lab/field report components: examples *could* include introduction, materials/methods, data tables, results, graphs, discussions, and conclusions.

Samples of Evidence

1. All students in the course must maintain a lab/field experience notebook in either hard copy or electronic format that contains completed reports for each investigation. Each report should be written in a format appropriate to the investigation, field experience, or standard protocol for an environmental assessment and could include components such as: Title, Introduction, Statement of Problem/Hypothesis, Methods/Procedures, Data, Data analysis, Results/Findings, and Conclusions.
2. The syllabus includes a lab/field experience section that outlines the format for the lab/field notebook or portfolio that is to be maintained throughout the year to document lab and field investigations. The outline includes the components of written lab and field reports such as: Title, Investigative Question, Procedure, Observations and Data, Analysis, Results, and Conclusions and Discussions.
3. The syllabus includes the use of written reports of investigative labs/field experiences to give students opportunities to write clearly and to reflect on their work. The written reports include the following components and are compiled in a laboratory/field experience notebook:
 - Testable Question for Investigation
 - Background Observations and Contextual Information
 - Hypothesis and Rationale for Investigations
 - Experimental Design: Variables, Controls, Constants
 - Results: Data Tables, Graphs (statistical analyses where appropriate)
 - Conclusions and Discussions